WHAT IS CLAIMED IS:

1. A method of nano-manipulation, comprising:

providing a nano-scale object movably located over a substrate;

positioning a probe of a scanning probe microscope proximate the nano-scale object; and

moving the probe across the substrate along a gyrating path proximate the nano-scale object to reposition the nano-scale object.

2. The method of claim 1 wherein moving the probe along the gyrating path confines the nano-scale object within a dynamic volume.

3. The method of claim 1 wherein the gyrating path comprises a gyrating pattern superimposed with a desired repositioning pattern.

4. The method of claim 3 wherein the gyrating pattern defines an enclosed area around the nano-scale object.

5. The method of claim 3 wherein the gyrating pattern comprises an orbiting pattern.

6. The method of claim 5 wherein the orbiting pattern is substantially circular.

7. The method of claim 3 wherein the repositioning pattern comprises a substantially straight line.

8. The method of claim 3 wherein the repositioning pattern comprises an arcuate pattern.

9. The method of claim 1 wherein moving the probe along the gyrating path repositions the nano-scale object continuously.

10. The method of claim 1 further comprising collecting data with the scanning probe microscope to monitor and control the gyrating path.

11. The method of claim 1 wherein the nano-scale object is an atom.

12. The method of claim 1 wherein the nano-scale object is a molecule.

13. The method of claim 1 wherein the scanning probe microscope is selected from the group consisting of:

a scanning tunneling microscope;

an atomic force microscope;

a near-field scanning optical microscope;

a scanning tunneling optical microscope;

a near-field scanning acoustical microscope;

a scanning capacitance microscope; and

a scanning electrochemistry microscope.

14. A method of nano-manipulation, comprising:

providing a plurality of nano-scale objects movably located over a substrate;

positioning a probe of a scanning probe microscope proximate the plurality of nano-scale objects; and

moving the probe across the substrate along a gyrating path proximate the plurality of nano-scale objects to reposition at least one of the plurality of nano-scale objects.

15. The method of claim 14 wherein moving the probe along the gyrating path confines the at least one of the plurality of nano-scale objects within a dynamic volume.

16. The method of claim 14 wherein the gyrating path comprises a gyrating pattern that defines an enclosed area around at least one of the plurality of nano-scale objects.

17. The method of claim 14 wherein the gyrating path contracts with time to position at least two of the plurality of nano-scale objects in close proximity.

18. The method of claim 14 wherein the gyrating path comprises a gyrating pattern that defines a plurality of enclosed areas each surrounding at least one of the plurality of nano-scale objects.

19. The method of claim 1 wherein the gyrating path extends in first and second orthogonal directions and the probe moves in the first and second directions according to first and second sine waves, respectively, wherein the first and second sine waves have substantially equal frequencies and are orthogonally out of phase.

20. A nano-manipulation system, comprising:

means for supporting a substrate having a nano-scale object movably located thereon;

means for positioning a probe of a scanning probe microscope proximate the nano-scale object; and

means for moving the probe relative to the substrate along a gyrating path proximate the nano-scale object to reposition the nano-scale object.